



# HVIGBT Line-up

## Overview

Powerex offers industry standard HVIGBT modules in expanding current ranges. This line-up includes both Powerex self-manufactured HVIGBTs as well as Mitsubishi HVIGBT power modules. These two product lines are complementary and offer a broad range of devices to suit your specific application.

Powerex HVIGBTs feature highly insulating housings that offer enhanced protection by means of greater creepage and strike clearance distance for many demanding applications like medium voltage drives and auxiliary traction applications.

## Applications

- High voltage power supplies
- Medium voltage drives
- Motor drives
- Traction

## HVIGBT Product Advantages

- -40 to 150°C extended temperature range
- 100% dynamic tested
- Advanced Mitsubishi chip technology
- Aluminum nitride (AlN) ceramic substrate for low thermal impedance
- Rugged SWSOA and RRSOA



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| VCE (V)<br>IC (A) | Single       |                              |                                           |              | Dual                         |                          |                                                      |                          | Chopper                                      |                                |
|-------------------|--------------|------------------------------|-------------------------------------------|--------------|------------------------------|--------------------------|------------------------------------------------------|--------------------------|----------------------------------------------|--------------------------------|
|                   | 1700         | 3300                         | 4500                                      | 6500         | 1700                         | 3300                     | 4500                                                 | 6500                     | 1700                                         | 3300                           |
| 85                |              |                              |                                           |              |                              |                          |                                                      | QIC6508001<br>QID6508001 |                                              |                                |
| 150               |              |                              |                                           |              |                              |                          | QID4515001<br>QID4515002<br>QIF4515002<br>QID4515004 |                          |                                              |                                |
| 200               |              |                              |                                           | CM200HG-130H |                              |                          | QID3320002<br>QID3320004                             |                          |                                              |                                |
| 400               |              | CM400HG-66H                  | CM400HB-90H                               | CM400HG-130H |                              | CM400DY-66H              |                                                      |                          |                                              | CM400E4G-130H<br>CM400E2G-130H |
| 500               |              |                              |                                           |              |                              | QID3340001<br>QID3350001 |                                                      |                          |                                              |                                |
| 600               | QIS1760002   |                              |                                           | CM600HG-130H | CM600DY-34H                  |                          |                                                      |                          | CM600E2Y-34H                                 |                                |
| 800               | CM800HA-34H  | CM800HB-66H<br>CM800HC-66H   | CM800HC-90R<br>CM800HG-90R                | CM800HG-130R | CM800DZ-34H                  |                          |                                                      |                          | CM800E2C-66H<br>CM800E2Z-66H<br>CM800E6C-66H |                                |
| 900/<br>1000      | QIS1790001   | CM1000HC-66R                 | CM900HB-90H<br>CM900HC-90H<br>CM900HG-90H |              |                              |                          |                                                      |                          | CM1000E4C-66R                                |                                |
| 1200              | CM1200HA-34H | CM1200HC-66H<br>CM1200HG-66H | CM1200HC-90R<br>CM1200HG-90R              |              | CM1200DB-34N<br>CM1200DC-34S |                          |                                                      |                          | CM1200E4C-34N                                |                                |
| 1500/<br>1800     | CM1800HC-34N | CM1500HC-66R<br>CM1500HG-66R |                                           |              |                              |                          |                                                      |                          |                                              |                                |
| 2400              | CM2400HC-34N |                              |                                           |              |                              |                          |                                                      |                          |                                              |                                |

CM = Mitsubishi manufactured modules

Q = Powerex manufactured modules  
**Complementary devices**

#### Package code for CM modules:

HB = Single, copper baseplate  
HC = Single, AlSiC baseplate  
HG = Single, high isolation,  
AlSiC base  
DB = Dual, copper baseplate  
DC = Dual, AlSiC baseplate

#### Suffix for CM modules:

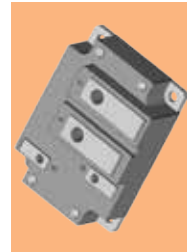
H = Standard type  
N = CSTBT™ type  
R = LPT  
S = CSTBT™ type



7.48 x 5.51 (190 x 140)



5.11 x 5.51 (130 x 140)



3.15 x 4.33 (80 x 110)



2.87 x 5.51 (73 x 140)

Footprint in. (mm)



# Powerex Military-AERO Expertise

## Product Advantages when Engaging with Powerex

- USA based manufacturing
- AS9100 certified (aviation supplier for 30+ years)
- MIL-PRF-38534 Class D (hybrid microcircuits)
- Full custom design capability to meet your requirements including:
  - Lighter weight packaging
  - High isolation voltage
  - Space constraints
  - Low inductance
- 100% visual inspected to military standards
- 100% screened to customer specifications with in house testing for:
  - Burn in
  - Gate burn in Vibration Mechanical Shock
  - Air to air temperature cycling
  - Dynamic testing
  - Moisture resistance
  - HAST
  - Salt spray
- Full analytical capabilities include:
  - X-ray
  - Acoustic microscopy (sonoscan)
  - X-ray fluorescence
  - SEM (scanning electron microscopy)
  - EDS (energy dispersive spectroscopy)

## Overview

When looking for demanding applications, and customer specific power modules, Powerex Military-Aero experience leads to next generation proven technology. Reliability and qualification testing meet rigid, military qualifications. Powerex experience covers many long-running aviation applications, including the F-16, C-130, F-18 Super Hornet, AH-64 Apache Helicopter, F-35 Lightning II, and commercial applications including the Dreamliner. When power dissipation demands solid state power, Powerex engineers can select the correct chip technology and screening of module capabilities and parameters, such as hermeticity;  $T_j$ ; to optimize the design. SiC advantages can include increased operating temperatures or lower weight modules.

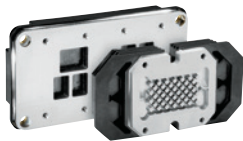
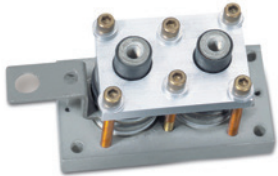
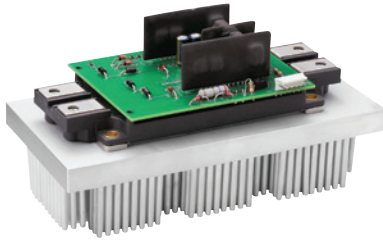
## Applications

- Solid state circuit breakers
- Generator systems
  - 3-PAC SCR modules for military jet generators, hermetic and near hermetic
  - 6-PAC SCR modules for military jet generators
  - Reliable supplier of power modules used in 270V DC electric power generation, conversion and distribution systems
  - Rotating diodes Si and SiC, including planar diodes
- Flight control systems
  - 7-PAC IGBT modules with brake and "soft-start" SCR
  - Brake modules
  - Dual IGBT flight surface control modules using two IGBT transistors in a half-bridge with each IGBT connected to a superfast free-wheel diode
- High energy power pulse
  - Light triggered diode for high energy pulse applications
- Turret rotation and targeting systems
  - Darlington and MOSFET modules for aviation applications
  - IFV (infantry fighting vehicle) power devices
- Traditional systems
  - 3-level power modules
  - Aviation module next level assembly capability
  - Devices that require MIL-PRF-19500 qualifications
  - Full SiC and hybrid SiC IGBT modules for R&D to reduce switching losses and high temperature operation
  - GCV (ground combat vehicle) power devices, including water cooled heatsinks
  - High voltage SiC power modules up to 15kV
  - Munition and missile systems, including the Aegis and Patriot Missile
  - Naval ships and submarine power systems
  - SCR based SABT (Static Automatic Bus Transfer) switches using large area phase control SCRs



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## Commercial / Moisture Resistant / Hermetic Custom Modules

### Reliability / Qualification Testing

Reliability and qualification testing can be performed in-house in accordance to military specifications, including Group A, B, C and D and specific customer requirements.

### Capabilities

Customers looking for application specific custom power modules benefit from Powerex's years of experience in chip manufacturing and design / engineering. Powerex custom power modules employ performance proven features.

Soldered-down and wire bonding fabrication and compression bonded encapsulation (CBE) of SCR / Diode elements offer increased switching speeds, lower losses, more efficient cooling and higher power handling capabilities.

### Features

- Different circuit configurations (i.e. common emitter, chopper)
- Different termination styles (i.e. thicker bus bars, D-sub connectors, press-on pins, etc.)
- Extended temperature range, -55°C to 200°C
- Hermetic modules
- High voltage isolation
- Integrated heatsinks – both air and liquid cooled by eliminating the baseplate
- Larger, free-wheel diodes
- Low module weight
- Moisture resistance
- Over-current shutdown
- Package height, width and length
- Temperature and current sense

### Substrates:

- Alumina
- Aluminum Nitride
- BeO
- IMS

### Die Technology:

- Diode
- FR Diode
- GTO
- HVIGBT
- IGBT
- JBS Schottky Diode
- MOSFET
- Planar Diode
- SCR
- SiC Diode
- SiC MOSFET

### Packages:

- Custom development for both plastic and hermetic packages
- Picture frame
- Standard IGBT cases



Registered Directorate of Defense Trade Controls (DDTC)  
Certified MIL-PRF-38534 Class D (Hybrid Microcircuits)

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# Gate Drive Solutions & Development Kits

## Applications

- Inverters
- High frequency power supplies
- AC servo systems
- Welding
- Induction heating
- General industrial use
- Prototyping & production

## Product Advantages

- Reduce engineering design time and expense by utilizing proven gate drive designs.
- Compact designs save costly space in circuit layouts.
- Built in, isolated DC-to-DC converters included on most gate drivers.
- Gate drive solutions designed specifically to work with your Powerex modules.

## Overview

Powerex provides a variety of gate drivers and accessory components to simplify your power semiconductor development. This includes:

- **Gate Drivers** – Power amplifiers that take signal-level control input and create the desired gate drive output for power transistors. They provide optically isolated control signals to the power transistors which demand higher voltage and current than can be provided by a 5V logic control signal. Built-in desaturation protection is included on most types.
- **DC-DC Converters** – On board power supplies that offer 15V and 24V isolated input and output DC voltage. Over current protection circuits are built in.
- **Plug & Play Drivers** – Completely populated gate driver boards designed to drive specific modules or IGBT packages.
- **Prototype Development Kits** – Complete gate drive circuits designed for use with IGBT models intended to shorten prototype build time, not for commercial production use.

## Plug & Play Driver Solutions

| Plug & Play Driver Solution | Applicable Module                  |
|-----------------------------|------------------------------------|
| VLA536-01R                  | Any 600V & 1200V Dual NX-M Modules |
| VLA553-01R<br>VLA553-02R    | CM2500DY-24S<br>CM1800DY-34S       |



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## IGBT & MOSFET Driver – Development Kit Compatibility

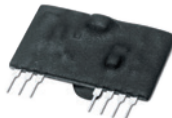
| Driver IC   | Applicable Module Ratings                                            | Switching Frequency | Driver Peak Output Current | Development Kit* | Recommended DC-DC Converters                                       | Application                                                    |
|-------------|----------------------------------------------------------------------|---------------------|----------------------------|------------------|--------------------------------------------------------------------|----------------------------------------------------------------|
| VLA567-01R  | 600V up to 1000A,<br>1200V up to 1000A                               | <20kHz              | ±8A                        | <b>BG2G</b>      | Integrated                                                         | General Industrial                                             |
| VLA500K-01R | 1700V up to 1000A                                                    | <20kHz              | ±12A                       | <b>BG2A-K</b>    | Integrated                                                         | Use with 1700V IGBTs                                           |
| VLA552-01R  | All 600V,<br>All 1200V, 1000A to 3600A,<br>All 1700V, 1000A to 3600A | <20kHz              | ±24A                       | <b>BG2F</b>      | Integrated                                                         | General Industrial with High Driver Output Current Needed      |
| VLA513-01R  | 600V up to 600A,<br>1200V up to 400A                                 | >20kHz              | ±5A                        | <b>BG2C-5015</b> | VLA106-15242 ( $V_{IN} = 15V$ )<br>VLA106-24242 ( $V_{IN} = 24V$ ) | Welding Induction Heating Inverters                            |
| VLA502-01R  | 1200V up to 600A                                                     | >20kHz              | ±12A                       | <b>BG2A-NFH</b>  | Integrated                                                         | Inverters AC Servo Systems with Switching Frequency >20kHz     |
| VLA542-01R  | EXS Series 600V up to 600A,<br>EXS Series 1200V up to 400A           | <20kHz              | ±5A                        | <b>BG1B-5015</b> | VLA106-15242 ( $V_{IN} = 15V$ )<br>VLA106-24242 ( $V_{IN} = 24V$ ) | Single Channel Chopper, Buck or Boost for Inverters & AC Servo |

\*Development kits are intended to shorten prototype build time, not for commercial use.

## IPM – Development Kits

| Development Kit*                                                                                 | IPM Series | IPM Package                                | Module Rating                            | Included Accessory ICs           |
|--------------------------------------------------------------------------------------------------|------------|--------------------------------------------|------------------------------------------|----------------------------------|
|  <b>BP7B-LS</b> | L1         | A (131mm x 67mm)<br>or<br>B (120mm x 55mm) | 600V, 50 to 150A<br>1200V, 25 to 75A     | VLA106-15151 x4<br>VLA606-01R x1 |
|                                                                                                  |            | C<br>(135mm x 110mm)                       | 600V, 200A & 300A<br>1200V, 100A & 150A  | VLA106-15151 x4<br>VLA606-01R x1 |
|  <b>BP6A-L</b> | L1         | D<br>(150mm x 172mm)                       | 600V, 450A & 600A<br>1200V, 200A to 450A | VLA106-15151 x6                  |
|  <b>BP2B-V</b> | V1         | Small<br>(120mm x 70mm)                    | 600V, 400A & 600A<br>1200V, 200A to 450A | VLA106-15151 x2                  |
|                                                                                                  |            | Large<br>(120mm x 90mm)                    | 600V, 900A<br>1200V, 600A                | VLA106-15151 x2                  |

\*Development kits are intended to shorten prototype build time, not for commercial use.

| Accessory Part Number                                                                                                             | IC Type                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
|  VLA606-01R                                   | 6 Opto-Couplers / IC                                     |
|  VLA106-24151<br>VLA106-24154<br>VLA106-15151 | 24V DC to 15V DC<br>24V DC to 15V DC<br>15V DC to 15V DC |



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